

# Gene pyramiding breeding contributes world food supply

**Motoyuki Ashikari**

Food shortage is one of the most serious problems confronting humanity in the 21<sup>st</sup> century. FAO reports showed that 1.02 billion of the world's 6.4 billion population is undernourished and most of them come from developing nations. Everyday, 25,000 people die of hunger and hunger-related causes, and 14,000 of them are children under the age of 5. Indeed, the World Food Program reported that greater than AIDS, malaria and tuberculosis combined, hunger and malnutrition are in fact the leading risks to health worldwide.

How do we break through this? Plant research has the potential to alleviate the problem. Cereals such as rice, wheat and maize provide 50% of the caloric intake of humans worldwide. Since these crops are lifelines for humans, increasing crop production is one way to solve the problem. Once, in the 1960s, man already succeeded in averting a food crisis by breeding useful genes into rice and wheat. During that time, concerns that food production would not be able to meet the growing demand posed by the rapid increase in world population and reduction in lands utilized for agriculture were rampant. This led to vigorous efforts to develop high yielding rice and wheat varieties, which later led to the rice and wheat "green revolution".

Now, the world population is growing at an unprecedented rate of 1.4% annually. In 2050, it is expected to reach over 9 billion and exacerbate the problem on food shortage. If the world is to feed 9 billion by the next 40 years, it is necessary to increase grain production by 50%. For this to be done, it is important to identify genes that will drastically increase grain productivity and devise a breeding strategy that will successfully incorporate such genes into crops. In line with this, I identified genes for important agricultural traits, particularly for increasing grain productivity (1~4), and propose to incorporate these genes altogether in rice via gene pyramiding. Here I show the identification of genes regulating grain productivity and describe a breeding method using gene pyramiding to increase grain production for a 2<sup>nd</sup> green revolution.

(1) Sasaki et al. Nature 2002. (2) Ashikari et al. Science 2005. (3) Hattori et al. Nature 2009. (4) Miura et al. unpublished.

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Motoyuki Ashikari was born in 1969 in Japan.

He graduated from the Agriculture Department of Kagoshima University with a BSc degree in Agriculture in 1993. He graduated from the Agriculture Department of Kyushu University with an MSc degree in Agriculture in 1995 and a Ph.D. in Agriculture later in 1999.

He worked for one year as a Research Fellow of the Japan Society for the Promotion of Science in the National Institute of Agrobiological Resources. He was an Assistant Professor in the BioScience Center, Nagoya University from 2000-2003, an Associate Professor from 2004-2007, and has been a full Professor from 2007.

He was awarded the ISPBM (The International Society for Plant Molecular Biology) Student Travel Award in 1999, Young Scientist Award from Japan Breeding Society 2004, Nihon Nougaku Shinpo Award 2006, JSPS (Japan Society for the promotion of Science) PRIZE 2008 and Paper Award from Japan Breeding Society 2008.